DETECTION, MEASUREMENT, VISUALIZATION, AND ANALYSIS OF SEISMIC CRUSTAL DEFORMATION*

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SUMMARY

Remote sensing now plays a key role in the analysis of seismic crustal deformation. In recent years, radar interferometry has been well documented as a tool for measuring one dimension of the strain fields of earthquakes at a resolution on the order of centimeters. Here we demonstrate the utility of optical imagery in measuring *both* geographic dimensions of the strain field at resolutions down to the order of 1/20 of the pixel size. With the coming of 1 m optical data from spaceborne sensors in the next few years, optical imagery will have the advantage of two-dimensional measurement at high resolution,

Optical data also have the advantage of direct visual analysis in dynamic displays. Our procedure allowing the "first visual observation of fault motion from space" (using SPOT imagery) is now being extended to aerial photographs in order to detect details of deformation within and near fault zones. This research methodology will also greatly benefit from the availability of 1 m imagery from spaceborne sensors.

Remote sensing also plays a role in improving the visualization of seismographic data for the understanding of tectonic processes. We have completed a georeferenced Landsat TM mosaic of Southern California. Used in combination with digital elevation models, digitized fault maps, and the Caltech-USGS seismic catalog, we can now produce near-real-time visualizations of seismic events for tectonic analysis and public information during earthquake emergencies, Three-dimensional displays allow quick evaluation of ongoing processes which may indicate triggering mechanisms for even larger seismic events.

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